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ROYAL SOCIETY OF EDINBURGH.

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NINETIETH SESSION.

Monday, 2d December 1872.

SIR ROBERT CHRISTISON, Bart., President, in the Chair.

The following Council were elected:—

President.
SIR ROBERT CHRISTISON, BART., M.D., D.C.L., LL.D.

Honorary Vice-President.
HIS GRACE THE DUKE OF ARGYLL.

Vice-Presidents.
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Professor Sir WILLIAM THOMSON.
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DAVID MILNE HOME, LL.D.

General Secretary—Dr JOHN HUTTON BALFOUR.

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Professor TAIT.
Professor TURNER.

Treasurer—DAVID SMITH, Esq.
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Professor KELLAND.
Professor LISTER.
GEORGE ROBERTSON, Esq., C.E.
Captain T. P. WHITE.

BRITISH MUSEUM

Monday, 2d December 1872.

Sir Robert Christison, Bart., the President, read the following Opening Address:—

The Society now enters into its 90th session since its foundation. During the session recently concluded the number of its Ordinary Fellows has increased from 331 to 343. Twenty-two members were admitted during last session. In the twelve months ending with the 30th ultimo, death has laid his hands sparingly upon our brethren. During the former year we lost by death ten Ordinary and three Honorary Fellows, several of whom occupied during their lives a very high position in science. Last year has deprived us of only four Ordinary Fellows, and one on our Honorary list; and although these were all men of great estimation in their several professions, our Honorary Fellow alone, among them all, was widely known as a successful scientific labourer. Therefore the duty I have now to discharge as their biographer is evidently on two accounts a brief one.

The Ordinary Fellows who have disappeared from amongst us during last year are, Dr Thomas Barnes of Carlisle, Dr Patrick Miller of Exeter, Dr John Addington Symonds of Clifton, and the Right Reverend Charles Hughes Terrot, Bishop of Edinburgh in the Scottish Episcopalian Church. Our only deceased Honorary Fellow is Hugo von Mohl, Professor of Botany in the University of Tübingen.

The three first were graduates of the University of Edinburgh, each of them distinguished during a long life by his successful cultivation of medicine, and the pursuit of medical practice in an important district of England. It has often been remarked that there is scarcely in all England an important county town, where for almost a century past the leading physician of the town and surrounding country has not been a graduate of the University of Edinburgh. Drs Barnes, Symonds, and Miller illustrate a fact which the University has always regarded with allowable pride.

Dr Thomas Barnes was born in 1793, near Wigton, in Cumberland. He commenced his medical studies, according to the fashion of the time, by becoming apprentice to a medical practitioner in that town; where, among other duties, he had to supply physic to horse, dog, and cow, as well as to the human subject, to sell pepper and coffee, and to look after his master's Rosinante. Having thus cultivated medicine in a practical way, he proceeded, in the inverse order, to study the principles of medicine and its fundamental sciences in the University of Edinburgh at the age of eighteen. In more recent times medical students carry on their studies differently. Apprenticeship is at a sad discount with them. They study instead literature, philosophy, and physical science, then begin medicine at the root of the tree, and end their school studies with that of medical and surgical practice. It was different in the time of Dr Barnes' noviciate; even in my young days, two-and twenty-years later, I was almost a solitary example of an unapprenticed British student, working till the age of eighteen in the Faculty of Arts and at the Natural Sciences, instead of wasting the most precious of his years in dispensing drugs, and practising physic before learning it; and, indeed, there are even still some estimable men, *laudatores temporis acti*, who sigh over the now fast vanishing old rule, and lament the disappearance of medical apprenticeships, and the loss of apprentices.

Dr Barnes, after studying medicine for six years, partly in this University and partly in London, Paris, and Germany, took his degree at Edinburgh in 1817. Soon afterwards he settled as a consulting physician in Carlisle, where at first he made only that slow progress to which those must usually submit who choose this the highest class of medical practice,—but where before long he became for many years the leading physician over a great extent of the northern counties of England. In this pursuit he led a life of great professional activity and usefulness till his 56th year, when failing health led him to restrict his field. At the same time, he did much good to the place of his residence by founding some, and encouraging and improving other, important charitable establishments. Nor did he neglect the improvement of medical knowledge. For, though he never contributed any large work to the literature of medicine, he communicated from time to time to the professional journals many papers of acknowledged value.

Like most county and country practitioners of ability, he found recreation in cultivating a favourite branch of science, little, if at all, connected with his profession. This in Dr Barnes' instance was meteorology. His studies in this department of natural history were the main cause of his being associated with us as a Fellow of the Royal Society. A paper by him on "The Meteorology of Carlisle for 24 years," was read to the Society in 1830; and in the same year he was elected one of our Fellows. Forty years later, and therefore quite recently, he contributed to the Proceedings of the Society a continuation of his inquiries on the same subject.

Dr Barnes died in March last, in the 79th year of his age.

Dr John Addington Symonds, another county physician of great eminence in England, was born in 1807 at Oxford, where his father practised the medical profession. The opportunities of his birth-place gave him the inestimable advantage of an excellent general education, which ever afterwards shone out in his tastes and the occupations of his leisure hours. After taking advantage for two years of the limited opportunities which Oxford in these days presented for the study of the fundamental sciences of medicine, he repaired in 1825, being then in his 19th year, to the University of Edinburgh, where he graduated three years afterwards. He was a very distinguished student, as I personally know, for he was one of my pupils in 1827, when I was Professor of Medical Jurisprudence. Nor were his studies confined to medicine,—philosophy at that time being also a favourite pursuit. Returning to Oxford, he assisted his father in his practice for three years. But in 1831 he was induced to settle in Bristol; and there at first, and afterwards in conterminous Clifton, he passed his whole professional life.

Dr Symonds attained great reputation as a practising physician at an early age. Crowds were attracted to him from all quarters of Great Britain, partly no doubt by the salubrity of the climate of Clifton, but chiefly by the eminence of its physician. The climate had been long considered favourable for the treatment of certain common pulmonary diseases. Taking advantage of this peculiarity, Dr Symonds, while neglecting no corner of the field of medical practice, studied with great care and success the diseases of the lungs. In consequence, the suffering members of the community flocked to him in great numbers from all parts. Many went to him from Scotland, many from Edinburgh. Among the latter Principal Forbes, while Professor of Natural Philosophy, repaired to Clifton at my recommendation; and he derived so much benefit from his first residence there, under the care of Symonds, that he was able to struggle bravely with his malady for many years, and at one time indeed seemed as if about to shake off his deadly enemy altogether. Forbes often spoke to me with admiration and gratitude of the Clifton physician's kindness, skill, and philosophical acuteness; and it is no wonder that two such men continued fast and intimate friends ever after.

Local celebrities, in positions similar to that of Dr Symonds, not unfrequently owe success to qualities different from those which ought alone to give a title to it. Dr Symonds was none of these, but in every sense of the word a true physician of the purest dye, of excellent talents, rare assiduity, deep discernment, well-balanced determination, unpretentious bearing, thorough conscientiousness in every thought and act, a sincere unostentatious Christian,—in short, a man qualified to rise to a high rank wherever he might have chanced to choose his path in the medical profession.

But Dr Symonds was more than a physician. He had a fine taste for art. His classical training in youth led him to keep up familiarity with ancient literature. Philosophy, too, was his frequent recreation from professional toil. It is no wonder, therefore, that, when his part of physician had been discharged and came to an end, that of friend continued; and that he thus enjoyed through life the friendship and society of not a few of the most remarkable men in British literature, science, and politics during the last thirty years.

These his tastes are displayed in the subjects he chose for those of his writings, which have been collected and published since his death by his son. He has contributed less than he might have done to the literature of the practice of medicine in the strict signification of that term, though his experience eminently qualified him to illustrate it. His works in the posthumous collection of them consist of Essays on topics of a general nature, generally delivered as addresses to public meetings, and the titles of which prove the nature of his favourite pursuits, and the variety of his endowments. They treat of the Principles of Beauty, of Waste, of Decades of great events in the world's history, of Knowledge, of Sleep and Dreams, of Apparitions, of the Relations between Mind and Muscle, of Habit, of the Criminal Responsibility of the Insane, of the Public Estimate of Medicine, of the Health of Clifton, of Medical Evidence; and the last of these treatises is an address on Health, delivered at the Bristol meeting of the Social Science Association in October 1869.

There is none of these able essays, distinguished alike by sound sense, ingenious views, logical discussion, and purity of style, which might not be analysed here with credit to his memory, and advantage to those now listening to me. But I must remember that brevity is the first essence of this Presidential Address; and, therefore, I shall confine myself to a single paper, probably indeed not the most attractive of them for the general reader, but which illustrates well Dr Symonds' ability as a statistical inquirer and critic. In an address delivered at Bath, he tells us that "a severe shock was inflicted on the sanitary sensibilities of Clifton," by the town being gibbeted in the "Times" newspaper, on the authority of the Registrar-General's mortality returns, as "the most mortal of watering places,"—because, while at Torquay, Cheltenham, the Isle of Wight, &c., the annual death rate in every 1000 of the population ranged from 15 to 17 only, in Clifton it mounted so high as 24. The truth, as demonstrated by Symonds, is an admirable illustration of the frequent fallacy of statistics, and the danger when rash, ill-trained minds dare to deal with them. Dr Symonds shows that the supposed high death-rate is founded on a single quarterly return, while the returns taken from other quarters of the same year, or from other years, vary so much as from 24 down to so low as 14·8 in 1000 of the population; and he shows further that the returns made use of in the "Times" do not apply to Clifton the watering-place at all, but that the newspaper writer had committed the ridiculous mistake of confounding with it the "Clifton Union," a term including a far more extensive and populous district, from which the watering-place is sharply defined by site as well as by structure, and which adds to the count a great mass of the most needy population of the Bristol suburbs. Thus, raking away the rubbishy statistics of the newsmonger, he proves by irrefragable facts, on a scale of several annual returns, that the yearly mortality of the justly famous watering-place is no more than 17 in 1000.

Dr Symonds published, in the professional periodicals chiefly, various valuable papers on various strictly practical subjects, which it would be out of place for me even to enumerate here, and much more so to discuss. They were received as they successively appeared with approbation by his professional brethren, and may be perused now with profit by every professional student.

In 1854 Dr Symonds became a Fellow of the Royal Society of Edinburgh, led to us partly by his early connection with the University, and partly by the close ties of friendship contracted with many Scotsmen, of whom, or of whose relatives, he had been at Clifton the skilful and sympathising physician.

In the autumn of 1868 his health for the first time began to fail, and, though he took early warning and contracted greatly the field of his labours, his ailments grew upon him, and proved fatal on the 25th February 1871.

Dr Patrick Miller, another eminent physician who practised during a long life at Exeter, died there in December 1871, in his 90th year, Senior Fellow of the Royal Society of Edinburgh, and also, I apprehend, Senior Graduate of the University of Edinburgh, where he took his degree as Doctor of Medicine in 1804. I cannot find satisfactory evidence that any graduate of that year, or of those immediately preceding it, has survived him. In our own list there still stands one name for the year 1818, in which Dr Miller was elected a Fellow; but for some time past, on careful inquiry, no trace can be discovered for identifying this his contemporary.

Dr Miller was connected with us by ties dear to every member of our Society. He was grandson of the celebrated Professor of Mathematics in the University, Dr Matthew Stewart, and nephew of that Professor's still more famous son, Professor Dugald Stewart. He was educated here at the High School and University, under the eye, and very much in the family, of his uncle; a precious privilege, which, among other advantages, secured for him the early, and throughout life uninterrupted, friendship of several of the greatest men in the subsequent history of our country, such as Lords Palmerston, Lansdown, and Brougham, who were his uncle's pupils.

Three years after graduation he settled in Exeter, where he was so well received, that in two years more he was appointed physician of the Exeter Hospital for the sick. He soon became the leading physician of the town and adjacent country;—a position for which he was eminently qualified by his large, highly-cultivated mind, his courteous, kindly, gentle manner, combined with great energy and decision, high professional attainments, and a strong, robust, healthy frame and constitution. He was also constantly employed in doing good in other ways in the city of his adoption. He was an original founder, or active promoter, of every one of the various public institutions, organised in his lifetime at Exeter, for the bodily care and mental culture of the labouring classes, in whose welfare he constantly took great interest.

In these days of rapid development and change in the medical sciences, and in the details of medical practice, there are not many men of Dr Miller's unquestionable ability, who, in professional positions parallel to his, have not contributed by their writings to some branch or another of professional progress. But Dr Miller's tastes did not lie in the direction of medical publication, although his wide and long experience must have supplied him with great store of materials.

Until eight years before his death, Dr Miller continued to retain great bodily activity. Rheumatism, however, then gradually circumscribed his powers in that respect; but the faculties of his mind, even his memory, are stated by one who knew him well, to have been preserved unsubdued till very near the close of his life.

He repeatedly visited Scotland and Edinburgh, to keep alive his old associations; but for many years past I fear he must have encountered very few to recall to him his old associates. His regard for his University was shown a few years ago by his presenting to the University collection a valuable bust of his uncle, Dugald Stewart, by the sculptor Joseph; who has produced an excellent likeness of the philosopher, as I remember him on the only occasion when I ever saw him, in advanced old age, in the Edinburgh theatre, at one of the early representations of the late Mr Murray's famous dramatic conversion of "Rob Roy."

Charles Hughes Terrot, Bishop of Edinburgh, was a descendant of one of the many French families which the revocation of the Edict of Nantes drove from their native land to seek a home in this country. His father entered the Indian army, and was killed at the siege of Bangalore a few weeks after the birth of his son, which took place on the 19th of September 1790. To his mother accordingly fell the charge of young Terrot's education, and we may attribute to the influence of her powerful mind much of her son's subsequent eminence. Mentally as well as personally there was a striking resemblance between the two.

Before sending him to Cambridge, Mrs Terrot placed him with one of the good men of his day, the Rev. John Fawcett of Carlisle. In 1808 he entered Trinity College, Cambridge, where, as he was wont to say, he obtained his real education by daily converse with such men as Whewell, Peacock, Rolfe, Amos, Mill, and Robinson, especially the last two, with whom his intercourse ceased only with life. He took his degree in 1812, obtaining a position on the Honour list altogether inferior to what his subsequent appearance as a mathematician would have warranted us in anticipating. The fact is that Terrot's mind revolted at the drudgery of acquiring branches of the science towards which he felt no inclination. It was characteristic of him to tread a small circle, but to tread it well; and he was constitutionally unfitted for stowing away in his memory, for temporary purposes, facts and figures in which he took no interest. Thus his degree examination resulted in a comparative failure. Nevertheless, on the Fellows of his college this failure made no impression. They had enjoyed ample opportunities of judging of his accuracy and of his acuteness, and they did not hesitate to elect him into their body in the very year in which he took his degree. He did not retain his Fellowship many years, having married in 1815, and settled in

Haddington. The leisure of a country incumbency permitted his entering the list of competitors for University honours of a literary kind. In 1816 he obtained the Seatonian Prize for a poem on the Destruction of Sennacherib's Army before Jerusalem.

To have been the author of a successful prize poem in the University of Cambridge is not a little honourable, though it must be confessed that secular themes have enlisted a higher display of genius on their side than sacred. Witness such names as William Whewell, Thomas Babington Macaulay, and Alfred Tennyson. Still Terrot's poem is very far from being an ordinary production. Portions of it indeed are deserving of a high rank, and as a whole it is striking and effective. The finest part is the night scene, in which is depicted the Assyrian army encamped before the walls of Jerusalem, waiting with feverish anxiety the first streak of dawn to commence the assault. The author introduces the reader to a humble tent, in which lie two soldiers, restless and tossing through the whole night. Each dreams his dream. The one, eager for battle,

> "Dreams that with Jewish blood his spear is red."

He has cleared the ramparts, and with his comrades is rushing wildly on the devoted city. The other, "of softer mind," is carried away to the home of his affections on the banks of the Tigris,

> "To the rude cot where dwelt his infancy."

He is welcomed back by his friends "with a smiling tear,"

> "And she whom best he loves, who loves him best,
> Hangs round his neck, and weeps upon his breast."

The pleasant dream is broken by the frantic struggles of his comrade. He awakes,

> "And fear comes over him,—he knows not why."

The curtains of the tent are shaken;

> "a blast
> From heaven moaned low and sadly as it passed."

It is the "icy wind of death." On that blast rides the avenging angel, carrying "the last long sleep" to all that slept that night in the Assyrian host.

The success of this his first poem seems to have inspired Terrot with the ambition to try a more difficult theme. In 1819 he published anonymously a poem, with the rather prose-inspiring title, "Common Sense." In this production the poets and politicians of the day were pretty freely criticised by a hand which wielded some of the power of the Dunciad and the Rolliad combined. That the poem was vigorous and pointed no one who knew Terrot can for a moment doubt. But it was not the less a great mistake in the author to attempt to weigh poets in the balance of common sense; and the attempt accordingly failed. A line or two from the first page may be taken as a specimen:—

> "Time was when bards were few: then might you see
> In Button's room the whole fraternity.
> But now, like Egypt's frogs, on every hand
> They spread, and croak, and darken all the land."

As a poet, then, it is clear that Terrot would have found himself in very unpleasant society. He accordingly renounced the fraternity, and carried his common sense, of which he had an abundant stock, to the regions of theology and mathematics. With his theology we have in this place no concern. But a very graceful recognition of its merits has appeared in the sketch of Terrot's life from the pen of Dean Ramsay, who has delineated his character by a few well-marked and kindly touches.

Our concern is only with his mathematics. To mathematics, when harassed by the cares and vexations incident to his position, he had recourse as a retreat from irritating thoughts. His passion for this science was strong enough to take possession of his mind, and soothing enough to settle it down to repose. Bishop Terrot contributed several papers to the Transactions of this Society. The subjects treated of were the Properties of Numbers; the Square Roots of Negative Quantities as Symbols of Direction; and the Theory of Probabilities. To the papers on the second and third of these subjects it may be permitted to make more than a passing allusion.

In January 1847 he read to the Society a paper, entitled, "An Attempt to Elucidate and Apply the Principles of Geometry, as published by Mr Warren in his Treatise on the Square Roots of Negative Quantities." The subject here treated of had been floating somewhat dimly before the eyes of mathematicians for half a century, and was just then beginning to assume a living form in the mind, and a living exponent, though a somewhat obscure one, in the writings of Sir W. R. Hamilton. It was not until six years later that the doctrine of Quaternions of the great master, as developed in his "Lectures," swallowed up in its vast amplitude all that had preceded it. Terrot must accordingly be considered as one of the pioneers of the science. In the paper now referred to he points out the applicability of the method to plane trigonometry in all its parts; but he could see his way no further. Years after, when paralysis had laid him low, on being told that Symbols of Direction had been embodied by Sir William Hamilton into the full-grown science of Quaternions, his delight was expressed in the form of thankfulness that enough of life had been spared him to know that the dream of his early years had been realised, even although all power to comprehend it had passed away from him.

In 1858 Bishop Terrot published in our Transactions a paper "On the Possibility of Combining two or more Probabilities of the same Event, so as to form one Definite Probability." This paper was his best contribution to mathematical science. In addition to its own excellence, it has the merit of having drawn forth the valuable paper of the late Professor Boole, "On the Application of the Theory of Probabilities to the Question of the Combination of Testimonies or Judgments," to which the Council of this Society awarded the Keith medal in 1858. In this paper the conclusions of Bishop Terrot are confirmed, and a flood of new light is cast on the subject. It ought perhaps to be added, that an extended correspondence between the Bishop and Boole had preceded the publication of the papers in question; in which the Bishop had steadily manifested an anxious desire both to promote the advance of science, and to aid Boole in his upward career. Selfish ends had no place in the Bishop's mind.

In dismissing this brief notice of Bishop Terrot's scientific connection with the Royal Society, it may not be amiss to add a word or two on his personal connection with us. For many years of his life he was one of the regular attendants of our meetings; and when not actively engaged in the work going on, he was an attentive listener, and, when occasion called for it, an unsparing critic. He had a real love for the Society. As he left the building for the last time, he expressed himself to the effect, that thenceforth his heart would be with us, but that the work of his hands was done. The only part of our proceedings which he did not relish was the tea-drinking after the meeting.

What the Bishop was in private it is for others to tell. Dr Hannah, one of his most intimate friends, testifies of him, that he rejoiced in conversation, and never tired of it so long as, in his own phrase, "the talk was good;" and that, with the keenness of his wit and the quickness of his repartee, he united tolerance and good nature. Dr Fawcett, who also, when a medical student, knew Bishop Terrot well, says, "his manner was short and abrupt, but he was always spicing it with something good." Not a few members of this Society can likewise bear testimony to his wonderful felicity in conversation. But we are now more concerned with the impression which he made on society at large. He was there eminently conversational. He did not talk much; but he talked well. He had the faculty of saying powerful things in a few pithy, pointed words, which always hit, and generally remained fixed in the mind. His humour was dry, even caustic; but neither personal nor ill-natured. His criticisms of authors were sometimes severe, but they were never meaningless. For example, of one of Goethe's later works of fiction, which to ordinary minds appears wild and extravagant, Terrot was wont to say, that Goethe, having during a long life inhaled incense from the worshippers of his genius, had in his old age become satiated, and accordingly gave the world what he knew to be worthless, in order that the admiration it should call forth might ascend as pure incense direct to himself.

This remark of the Bishop's, whatever it may be worth, will help us to get a faint glimpse at a prominent feature in his character as a man. The feature in question was a dread for himself and a dislike in others, of appearing to assume that to which they had no just title,—of seeking out the upper chambers,—even of claiming a place to which the world at large would raise no objection. This feeling rendered him sensitive as regarded himself, and critical in his remarks on others. But his judgments were tempered with so real an insight into character, so just an appreciation of all that was worthy, and withal were so free from the suspicion of envy or jealousy, that they never produced a rankling sore or gave rise to a bitter repartee.

The Society will kindly treat with indulgence this imperfect attempt at the portraiture of one of the most noteworthy of those whom death has recently removed from among them.*

Hugo von Mohl, the only Fellow whom death has struck off our Honorary list during the last year, was long eminent among the botanists of the Continent for his researches in Botanical Physiology. In his student days medicine was his main pursuit, but combined with the ardent cultivation of botany and geology. He graduated with great distinction at Tübingen, and was encouraged to make medicine his profession by his father, who filled an important office in the Würtemberg Government. But the son's bent was turned more and more to botanical investigation, which by degrees became his great object in life, to the utter disregard of medical practice. He entered on his task with the great advantage of a mind highly cultivated in the collateral sciences, as well as in the languages. With the further advantage of a robust frame and constitution, he was enabled to make at an early age frequent successful excursions in his own neighbourhood, and also in the Alps, gathering extensive collections of plants, and accumulating materials for future study. He then commenced his researches into the anatomical structure of the Palms, Ferns, and Cycads. In his twenty-sixth year he was appointed Sub-director of the Imperial Gardens at St Petersburg; next year, without having taken up that office, he was elected Professor of Physiology in the Academy of Bern, and then in the University of that city; and in his thirtieth year he was promoted to the Chair of Botany in his own University of Tübingen. Eight years afterwards, on account of his services to science, he was raised by the King of Würtemberg to the rank of nobility. A few years later, in spite of his apparently robust constitution, he became subject to catarrhal affections. Although he succeeded in throwing off this enemy, he subsequently suffered from pleurisy, and also from liver complaints. Again restored to health for some time, he was seized, in May 1871, with obstinate giddiness, which, although it disappeared and left him apparently well, was nevertheless the presage of his end; for, on the 1st of April last, he was found dead in bed, having to all appearance sustained an attack of apoplexy during the night. He died in the 67th year of his age.

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* For the preceding sketch of Bishop Terrot's life, the Society and I are indebted to Professor Kelland.

Mohl published his researches chiefly in the form of occasional papers or monographs. He is the author of two books only, the one on Micrography, the other on The Vegetable Cell. But his occasional papers are no fewer than ninety in number, the most remarkable of which belong to the domain of Vegetable Histology —the earliest and most important being his treatise *De Palmarum Structura*, published in 1832, in his twenty-sixth year. Many of his writings relate also to Vegetable Morphology and Botanical Geography, and some to Botanical Physiology. In every branch his researches display much originality, and have added materially to the structure of modern botanical science.

Professor von Mohl was a tall, strong man, a bachelor, reserved in manner and disposition, of retired and somewhat peculiar habits, in all things conscientious and upright, free altogether from vanity, regardless of all consequences in upholding the truth, entirely devoted to scientific research.

Having now discharged to the best of my ability, within the space to which I am confined by the necessary limits of this address, the duty owing to the memory of our Fellows who have been removed from among us by death during the twelvemonths just concluded, I do not know that I can apply the rest of your time this evening better than by referring to the present position of certain scientific proceedings in which the Society takes an interest.

The first subject I shall take the liberty of bringing under your notice is the present condition of the Ordnance Survey of Scotland.

I am almost afraid to say—in the year 1872—when the Government Survey of our division of the United Kingdom was commenced; but it had made some progress when I witnessed a demonstration, by the chief surveying engineer, of the construction and powers of Ramsden's great theodolite, stationed on the Calton Hill in the year 1817 or 1818. Now in the present year, as we may gather from the catalogue of published maps which appeared by authority on the 8th of May last, there remains to be published about two-fifths of the sheets of the 25-inch survey; fully one-half of those on the 6-inch scale; and of those on the 1-inch scale—the scale most generally desired by the public at large—no less than two-thirds of the whole. In the course of a life which has not been short I have witnessed the completion of one-third part of the Survey. At this rate, some grandson of the youngest among you, if he be fortunate enough to attain a great age, may be also so lucky as to see the whole maps before he dies; and yet I cannot guarantee even him that pleasure.

To the 1-inch map of Scotland the index map of the May Report assigns 120 compartments or sheets; but Orkney and Shetland, which are left out, will require three more. Of the whole number, only 44 were published on the 8th of last May—38 of them shaded, and 6 in outline. These embrace all Scotland south of the Forth and Clyde, and, to the north of that boundary, the counties of Fife, Clackmannan, Stirling, and Dumbarton, most of Perthshire, all Forfar and Kincardine, a little corner of Aberdeen, the island of Arran, and, far apart from all other completed work, the "Ultima Thule" of the west, the island of Lewes. Since 8th May there have been issued separate slips, showing what has been added since, viz., two sheets, one of which is an outline map of a small portion of the coast line of Aberdeenshire, and the other the small corner of that county already mentioned, with a conterminous part of Kincardineshire, converted from outline into a shaded map. The Society will judge for themselves how much remains to be done, and what is the rate of progress of the 1-inch maps.

The misery of the want of two-thirds of these maps is enhanced by the minute accuracy and admirable execution of those which we do possess. Permit me to illustrate this statement by a single incident. This was no more, indeed, than an incident in the holiday life of a wanderer in quest of recreation; but numberless analogous occurrences must happen to others engaged with more important objects. Four years ago I made a long day's excursion from Arrochar, with an English friend, round the base, up to the summit, down again a great way, then up again over a lofty spur into an upland valley, of one of the neighbouring mountains, Ben-Arnen; which is very seldom visited, although it is very interesting in structure, and 3050 feet in height, and commands a magnificent view in all directions. Descending into the heart of the valley, in which there are many fine precipices, we twice came suddenly near the brink of these, as a stranger is apt to do in going down hill on such mica-slate mountains; but the instinct of experience forewarned us of our approach to danger, and enabled us to avoid it by a flank route. On returning to town, I tried to trace this excursion on the best of our ordinary maps, but in vain; for in some our mountain was not to be seen at all, while in others it was put in evidently *ad libitum*, and in not one was it named. In the Ordnance shaded 1-inch map, however, every valley, every spur, ravine, grassy slope and precipice is given so precisely that I am sure I could furnish any stranger to the mountain with a route upon that map by which he could safely follow our track. All praise, therefore, to Sir Henry James and his faithful assistants, who could little have thought that their work, in so remote, wild, and little known a corner, would be subjected to such minute criticism from so improbable a quarter. It is not in his department that the blame lies for the hideous delay in the progress of the Ordnance Survey of Scotland, and for our not having long ago reaped all the advantages of its completion. Very far from it. But what are we to say of the blindness, and deafness, and misplaced economy of successive Governments, who, possessing such an admirable instrument as the Ordnance Survey Office, refuse to make use of it, to the full extent of its power, in one of the most important and most attractive of all branches of civil administration? And what has become of the nobility, gentry, men of science, and others in Scotland, who in former days did not sit so tamely under disregard of their just claims upon the State?

The publication of the maps upon the 6-inch scale is somewhat farther advanced. These include, besides the country mapped on the 1-inch scale, all Perthshire, most of Aberdeen, all Banff and Nairn, Cantyre, and the southern half of the other peninsula of

Argyllshire, which is bounded by Loch Long and Loch Fine, with the island of Bute.

The maps on the 25-inch scale are advanced still farther, especially when it is considered that this large scale is not applicable to a great extent of mountainous, unproductive land throughout the Highlands and Islands of Scotland. In northern parts they include, besides the counties mentioned above as portrayed on the 6-inch scale, that of Elgin, a third part of Inverness, most of the Argyllshire mainland, but none of its islands; and, very far north indeed, the Survey now extends to a small patch comprising the central parish of Watten in Caithness, which thus hangs "en l'air," far remote from every other indication on the index map of Ordnance Survey operations. Very singular are the omissions in the more southerly counties. Fife is altogether excluded; so is Kinross, and so are Mid-Lothian and East Lothian, four of the most purely agricultural counties; to which must be added the more chequered shires of Kirkcudbright and Wigtown. Perhaps these rich districts are already so far provided with every desideratum which an accurate and minute survey is intended to promote,—roads are so abundant and perfect, railways so numerous, water-supply so complete, field-drains so perfect, estates so well surveyed by their possessors,—that such counties may be left by Government to look after themselves. But there should be better reasons, I imagine, for districts of so great importance being left so long unprovided with that scale of survey and map for which they are peculiarly fitted.

A single word more on this subject. How is the 25-inch survey to be made accessible in Scotland? By individuals purchasing such of the separate maps as they severally need? But there are various professions whose members may require to consult very many, and to have access, at one time or another, to all. But no such individual can afford to pay L.1500, the price of a complete set of 25-inch maps, or the space for preserving them conveniently accessible. It would surely be no unreasonable demand on the parental care of Government that a complete set should be made accessible to the public at Edinburgh, Glasgow, and Aberdeen. I understand that some such boon has been asked for, but declined.

I have here pointed out a line of action in which the Royal Society may usefully exert itself. It has, indeed, done so without avail before now; but that was a number of years ago. Government may at last be roused to do justice if repeatedly appealed to; and it should be remembered that we have to knock at a door, which in general must be well battered before it can be opened.

Having considered the present occasion an apt one for reminding you, and through you the public at large, of the great desire expressed by this Society about eighteen months ago to obtain a thorough catalogue and scrutiny, and general concurrence in the preservation, of the most remarkable boulders in Scotland, I have asked the chairman of our Boulder Committee whether he could supply me with any information for the Society as to the progress made in this matter since the printing of the very full and able report of the Committee last April. Mr Milne Home agreed with me that the time and occasion are opportune, and has therefore kindly furnished me with some interesting particulars and general views, which I am sure you will approve of my having elicited, and which I shall now present very much in his own words.

Mr Milne Home continues to receive from abroad assurances of warm sympathy on the part of Continental associations engaged in the same work. He has not yet received, in reply to the invitations issued by our Committee, any communications from geologists and others, who, in their wanderings last summer and autumn, must have had opportunities for adding to the Committee's stock of facts. But may I not hope that this appeal may even still elicit a favourable reply? In the meanwhile Mr Milne Home has himself acquired, by his personal exertions, so much new information, that we shall scarcely feel this year the want of communications from others.

Desirous of carrying through in some measure the inspection of known boulders asked for by the Committee, Mr Milne Home made a tour "through the districts indicated by the following towns, viz., Callender, Aberfeldy, Pitlochrie, Dunkeld, Perth, Forfar, Aberdeen, Forres, Elgin, Nairn, Inverness, Tain, Kingussie, Lochaber, Fort William, Glenelg, Tyndrum, and Killin.

"Many of the boulders in these districts are entered in the list of the Committee's Preliminary Report; but Mr Milne Home also fell in with many others which will be detailed in the next Report. The present sketch will be mainly confined to some points bearing on the probable mode of transport of the boulders.

"1. The first inquiry was the quarter whence the boulder had come, when the rock composing it was different from the rocks of the adjoining district. In all the districts visited the parent rock seemed situated in a direction between north and west from the boulder. This fact did not surprise me in regard to those in the counties of Stirling, Perth, Forfar, and Kincardine;—situated as they were principally in the low grounds south and east of the Grampians, which undoubtedly produced them. These boulders had probably come down the valleys. But boulders were also found in the counties of Moray and Nairn, which apparently had come from the same direction, viz., from points between north and west. Here the same explanation was impossible; for they must have travelled across a considerable extent of sea. In these two counties, there are boulders of granite, gneiss, and a very compact conglomerate, which came most probably from Caithness, Ross, and Cromarty; and besides these rocks, of which great mountains exist in the north-west, there are to be seen smaller boulders of oolite,—a rock forming a narrow fringe along the eastern shore of Ross and Caithness.

"This point being of some importance with reference to the mode of transport, one or two other facts may be mentioned which seem to confirm the conclusion that the boulders of Moray and Nairn had come from the north-west. 1. The rocks of the hills on or near which they lie, had manifestly been shaven, ground down, polished, and scored by some powerful and wide-spread agent passing over them from the same direction. 2. In most cases the boulders lie on hill-slopes facing the north-west, as if arrested in their farther course by the high ground. I could not help concurring in the remark of a farmer, who was pointing out to me four or five huge boulders on the same hill-slope, that 'in takkin' the hill, they had stuck on it." 3. In most cases the boulders, when long-shaped, lie with their longer axis in a north-west direction, and also with their sharper end towards the same quarter, as if moved into that position by some agent which had been flowing past them. These facts seem to indicate conclusively, that some powerful agent had passed over this part of the earth's surface, crossing what is now an arm of the sea, the Moray Firth, carrying great masses of rock, and dropping them at considerable distances.

"In the counties of Moray and Nairn, the boulders are at all heights, from the sea-level close to the shore, up to the height of about 500 feet. But in other districts they are to be seen as high up as 2500 feet above the sea. Many of them are perched on hill-tops, or very near the tops, and many are in such positions as to indicate that, whatever was the transporting agent, they could not have fallen from any height. These positions are rocky hill-sides, where the slope is so considerable that the boulders could easily have slid down with a very small amount of force applied.

"The angular form of the boulders is also instructive. Thus there is one huge cubical block of old conglomerate on the border of Nairn with Inverness, called "Tom Riach," to which Captain White first called attention, each side measuring almost exactly 21 feet. It lies on nearly horizontal beds of Old Red Sandstone, in a wide valley, with no cliff near it. There can be no doubt that this boulder, weighing betwixt 600 and 700 tons, must have been brought from a great distance—and otherwise than by rolling or pushing, because, from the sharpness of its angles, it evidently had undergone no friction. There are hundreds of boulders, which, lying on the open surface of the country, sometimes on bare rocks, sometimes on gravel deposits, give similar proofs that they must have been transferred by some agent, without friction. The boulders referred to, are generally single; but there are two districts where they are huddled or grouped together in such a way, as to indicate that they had been all brought to the spot by one transporting agent which went no further in its forward course. One of these places is to the south of Inverness, at or near the mouths of two valleys which unite at their lower ends. It is just beyond the mouths of these two valleys that the boulders occur in enormous numbers, composed of rocks existing in the valleys, to the west and north west. Another place is Lochaber, where there are long thick lines, or trainees, of boulders, forming parts of a semicircle or horseshoe, the concave sides facing a valley, from which the boulders appear to have issued. In this locality there are also elongated mounds of rubbish, running more or less parallel with the lines of boulders,—very similar to the moraines so common in Switzerland. The impression made on the mind by an inspection of these two localities was that the transport of the boulders found there was due to glaciers.

"There is a third class of boulders, distinguished from the two classes just referred to. The latter are generally angular, and lie on the upper surface of the land. The third class are rounded in shape, and imbedded in gravel or clay. They are, in short, huge pebbles, having evidently undergone tremendous friction by being pushed or forced along an uneven surface, in contact with other stony materials.

"Some of the boulders belonging to the first and third classes have been carried great distances; and when it is considered that they had to pass across valleys, ranges of hills, and arms of the sea, the difficulty of the problem as to the mode of transference is vastly increased. For example, there are in the county of Berwick several granite and mica-slate boulders, which,—if they came from the Highland hills, as they probably did,—must have crossed many ranges of hills, and at least one arm of the sea, and one large valley, that of the Firth of Forth.

"Until many more facts have been ascertained, it would be a pity to form very decided opinions as to the agency of transport. Instructive as some districts are among those referred to above, there are others probably even more so on the west coast of Scotland, and on the Hebrides. It is desirable that the boulders reported from these quarters, should be visited scientifically; for in size and peculiarity of position, they are said to be even more remarkable than those now described. The Boulder Committee have in their custody schedules representing the place, size, and other particulars of these boulders, which they will lend willingly to any geologist who will inspect them and report on them.

"The Committee had two duties assigned to them. Besides ascertaining the position of remarkable boulders, they were to endeavour to secure the preservation of the most interesting. They have not yet proceeded to the fulfilment of this second duty, except in a single case, where, at the special request of a parish minister, they applied to the proprietor, on whose lands the boulder lay, to prevent the destruction of it by the tenant; and this application proved successful. When the Committee proceed further in discharge of the same branch of duty, they may experience some difficulty. It may, therefore, be not out of place to state now what has been done by the Boulder Committees of France and Switzerland on this point.

"These Committees have adopted several plans of conservation. In some cases, they have acquired a right of property in the boulder, by means of a regular deed, signed by the proprietor of the land. In some cases, the proprietor has granted this right only for his own lifetime. The identification of the particular boulder was matter of difficulty; but this has been got over by describing the land on which it stands, and cutting out on one of its sides the letter F for France, or S for Switzerland.

"The success of the Swiss Committee has been most gratifying. In the Canton of Soleure upwards of 200 boulders have been secured from destruction,—one of these being a magnificent block at Steinhof, weighing about 5000 tons. It was purchased by the Communal Council for L.16, and given to the Natural History Society of Soleure. The famous 'Pierre à Bot,' near Neufchatel, a granite boulder from Mont-Blanc, weighing about 2000 tons, now belongs to the Communal Council of the Canton. The blocks of 'Monthey,' which Principal Forbes described in this Society, have been gifted by the proprietor to the Helvetic Society of Natural Science. From the list appended to Professor Favre's Fourth Report of last year, it appears that the Swiss Committee have succeeded in insuring the preservation of several hundred boulders;—not all of gigantic size, but each interesting for some other reason, such as position, historical association, or traditionary name or legend, or for having been made triangulation points by a government survey, or marking the boundary between parishes or cantons, or because named after distinguished alpine travellers, such as Charpentier, von Buch, and Venetz.

"It is interesting to see how cordially the objects of the Swiss Committee are sympathised with, not only by the government, local as well as general, but likewise by the people at large. Professor Favre mentions in his last Report, that the Town Councils of Bienne, Bondry, and Soleure, and the Cantonal Councils of Berne, Friburg, Aargau, and Neufchatel have aided the Committee in various ways; and in a previous Report, he stated that the public purse had been freely opened to defray the expenses of the Committee.

"It would not be right to conclude without adding, that the Swiss Committee in their last Report have been pleased to take favourable notice of our own similar movement in Scotland, observing that it has received not only the support of the Royal Society of Edinburgh, but likewise the approval of the British Association for the Advancement of Science, and that the course of proceeding in Scotland is the same as that followed in Switzerland.

"Whether our Committee will adopt the Swiss plan of acquiring a right to property in any of the Scottish boulders is a question for consideration. Already good has been done by the inquiries which the Committee has instituted, and by their explanation of the scientific value and historical interest of the boulders; a disposition to preserve them has been thereby created which did not previously exist. The press has also noticed with approval the appointment of our Boulder Committee, and has no doubt influenced public opinion."

The Society will have no difficulty in perceiving with what view I have given on the present occasion this detailed communication from Mr Milne Home to me. I trust that the public may be encouraged to aid in the preservation of our boulders. I hope that geologists will without delay aid the Committee in visiting and investigating them. And it may be a question whether our own Council may not consider that they could scarcely expend more profitably a portion of our moderate funds, than in sending out some young but competent geologist to some of these distant parts of the country indicated by Mr Milne Home, where there are remarkable boulders, which have not yet been described or investigated, or even scientifically visited.

In the address delivered to the Society at the opening meeting in December last, I brought before you some observations on the

Temperature of the Water at Great Depths in Loch Lomond, as exemplifying that of the deep fresh-water lakes of Scotland generally. I afterwards communicated other observations made in the middle of April last, on the first approach of weather warmer than that of the preceding winter months; which, however, were unusually open and free from frost. The result was that between the middle of September 1871, to the middle of April 1872, in parts of Loch Lomond, varying between about 500 and 600 feet in depth, there is constantly at the bottom a great sheet of water from 250 to 350 feet in thickness, the temperature of which remained steadily at 42°, whatever might be the temperature of the surface-water, or that of the air immediately over it. I beg now to supplement these observations very briefly with a few made since, in continuation of them.

But allow me, in the first instance, to do justice to others who had previously made observations somewhat similar, and whose results were last year imperfectly, and some of them altogether, unknown to me.

So early as 1767, Horace Benedict de Saussure made thermometrical observations in the lake of Geneva, finding the temperature at 82 feet to be 55°·6, when at the surface it was 78°. This was in the middle of August.

In 1774, Mallet and Pictet, in a deeper part of the lake, opposite the Castle of Chillon, found at a depth of 300 feet a temperature of 51°, while that near the surface in August was 76°. This result, says Saussure, " is very remarkable ; for 51° is two degrees and a half below the mean temperature of the earth at Geneva."

De Saussure afterwards extended his researches greatly. But, in the first place, not being acquainted with any available register-thermometer for such observations, he laboured to construct one which should retain, when hauled up, the temperature it had attained at the bottom. He at last succeeded in constructing such an instrument by using a thermometer whose bulb was an inch in diameter, surrounding it with a non-conducting coat of wax, resin, and oil three inches thick, encasing the whole in a wooden box, two-thirds of an inch in thickness, and securing the whole with tight iron ferrules. His instrument, which was thus a cylinder above seven inches in diameter, had the lamentable defect of requiring to remain twelve hours at the bottom, to arrive at the temperature of the surrounding water. But the zeal and patience of the philosopher were a match for this trial, and his construction had probably the advantage of securing his bulb and tube against the disturbing influence of pressure, which must have been great in some of his experiments, but which, as he never refers to it, must not have occurred to him as a condition to be provided against. He then, between 1779 and 1784, made a number of observations on the lakes of Geneva, De Joux, Annecy, Thun, Bourget, Brienz, Lucerne, Constance, and Lago Maggiore; always reaching the bottom at depths varying from 80 English feet to 163, 240, 335, 350, 370, 500, 600, 620, and 950 feet. His observations were generally made at midsummer, a few in February, and a few also in October. Excluding the experiment in Lac de Joux, whose depth of 80 feet excludes it from the category of deep lakes, and that of Maggiore in a warmer latitude and locality than the Swiss lakes, we find that he never got a higher temperature than 42°·1, and once he got it so low as 39°·6. The deepest lakes on the whole gave the lowest temperatures, but by no means always in exact proportion. In the lake of Geneva the bottom temperature at 950 feet was 41°·7; and in that of Lake Constance it was 39°·6, at 370 feet only. He thought the time of the year made little difference; but he did not try the same lake in the same place in different months. He tries to show that locality did not much affect the question of temperature. But this is surely a mistake; for the vicinity of snow-clad mountains, and the hard winter they occasion, are the probable causes why the cold at the bottom of the deep lakes there is greater than is observed in so much higher a latitude as Scotland.

In fact, the deep temperature of a very deep lake must be ruled far more by the cold of winter than by the heat of summer. The cold water must continue to descend as long as the cold months last. The colder these months are, the longer that cold lasts, the greater must be the cold at the bottom, and the thicker the stratum of cold water. The warmth of the air in summer and autumn acting only on the water by conduction, cannot move the deep cold substratum upwards. The only other heating influence from above, a far more penetrating influence, is the sun's rays.

But the water of Loch Lomond is scarcely transparent enough to allow the sun's heating rays to penetrate so deep as 500 or 600 feet, and the transparency of the lake of Geneva is not so much greater as to permit us to assume that the heating portion of the sun's rays can penetrate to 620 and 950 feet. It may be, nevertheless, that a slight effect may be produced even at these great depths in this way.

But there is still another heating power available for raising the cold substratum of water, and that is the heat of the earth at the bottom. At Loch Lomond, at 600 feet, this ought to be about 60°. At the bottom of the lake of Geneva it ought to be about 72°. It is true that the conducting power of the rocky exterior of the earth is too feeble to allow of much effect from this heating power, but it must have some influence, however small. In one way or another,—by heat from the sun's rays, or heat from the bosom of the earth, or by the joint action of both,—it may be that the cooling influence of the atmosphere will be to some little extent counteracted. If so, the amount of this counteracting effect will vary according to the severity or mildness of the winter months. In short, the bottom temperature will rise a little in autumn after a very open winter; and it will not stand so high after a very severe one.

We have had an excellent opportunity of testing this view during the past summer and autumn, on account of the uncommon deficiency of cold weather last winter,—so great a deficiency that, as stated in my communication last spring, the mean atmospheric temperature of the six cold months was at Loch Lomond, by the calculations of Mr Buchan, 1°·4 higher than the average for thirteen preceding years.

Has this circumstance had any effect on the bottom temperature of Loch Lomond in deep soundings?

On 10*th April*, as stated in the Proceedings of the Society, the temperature at 594 feet, as near as possible to the place of observation in September, October, and November last, was 42°,—exactly as in these months. On 6*th May*, much intervening sunshine having prevailed for nearly four weeks, but with a cold atmosphere, the surface-temperature at the same place had risen only from 43° to 44°·5; and the bottom temperature was 42°·1. I did not attach any consequence whatever at the time to this difference. It might have been an error of observation; but three competent observers agreed in marking the index as at 42°·1. I had unhappily no opportunity of making any observation during the remaining summer months, which I now greatly regret. But on 8th August I went from Loch Goil to visit Dr Bennett at Loch Lomond, and with his assistance as an observer, got the following results, with the same thermometer as in former observations, viz., near the surface, 61°·5; at 200 feet, 44°; at 250 feet, 42°·6; at 300 feet, 42°·5; at the bottom, in 594 feet soundings, 42°·5. I returned on 22d August, and again, with Dr Bennett's check, obtained at the surface, 64°·5; at 300 feet, 42°·5; at 600 feet, 42°·4. A third time I returned on 19th September, and obtained at the surface, 57°·0; at 200 feet, 43·0°; at 582 feet, at the bottom, 42 ·66.

Here then is an appreciable rise,—as to which I know not where a mistake can exist,—since the autumn of last year, and taking place during the warm months only.

It would be rash to draw deductions from the observations alone of two such autumns as those of 1871 and 1872, the one following a rather hard, the other an uncommonly open winter. But do not these observations establish some hope that a single good observation, made, let us say, in the middle of August, of September, and of October, may be found to denote the relative quality of our winters, and to mark out cycles of it?

Everything here depends on the fidelity of the observer and the accuracy of his instrument. On this account, and for the sake of those who, I trust, will repeat these observations from year to year, I have to remark that the thermometer I used was always the same, a protected thermometer, by Casella, instrument-maker to the Admiralty; that its scale at 60° and 40° agreed exactly with three others intended by their respective makers to be exact, one of them, indeed, made by Casella himself; and that I had an opportunity of ascertaining two days ago, that it is proof against pressure, in an excellent machine, constructed for Professor Wyville Thomson's expedition by the able engineer Mr Milne. Marking 55°·0 in the air, it came out after being exposed to a pressure equivalent to that of 3000 feet of water, marking 66° by the mercury in both limbs; and in the minimum side the index remained exactly at 55°, while the index in the maximum side stood in close contact with the mercury at 66°. This instrument is subject to an alternative inconvenience, requiring nice adjustment of the force of the spring attached to the indices. If they are too tight, they may stick beyond the force of the magnet to move them, or so that the mercury may pass instead of pushing them. If they are too loose, a slight shock may alter their position. To avoid this risk, the simplest precaution is to paint the last eighteen feet of the line white. As the rest becomes deep brown in the water, the winder-up of the reel is at once apprised of the necessity of gradually slowing his speed before the instrument appears near the surface. The time necessary for the thermometer to assume a new temperature is considerable, and ought to be ascertained experimentally. Mine, instead of twelve hours, like that of De Saussure, takes seven minutes to move six degrees in a gentle current of uniform temperature. It had seldom to pass through so many degrees between one observation and another; but I allowed it always eight, and generally ten minutes, and in important observations near the bottom even fifteen or twenty minutes, for absolute security. But I believe ten minutes to be in all circumstances more than sufficient.

The late Mr James Jardine, civil engineer, and during his lifetime a prominent Fellow of this Society, made in 1812 and 1814 observations in Loch Lomond, Loch Katrine, and Loch Tay similar to De Saussure's and my own. These valuable observations have been recovered by Mr Leslie, in the form of the original draught, and have been communicated to the Society by Mr Buchan; but I find that most of them had appeared in Sir John Leslie's article *Climate*, in the "Encyclopædia Britannica," and again in an octavo collection of Sir John's treatises in that work, edited in 1838 by the late Principal Forbes. Jardine's observations may yet turn out more valuable than he could have anticipated, and already seem to me of such interest as to deserve further notice.

His experiments were made early in September. In Loch Lomond, in 1812 he found near the surface a temperature of 59°·3; at 240 feet, 41°·3; at the bottom, in 600 feet soundings, 41·1°. On Loch Katrine, the day previous, he found 57°·3 near the surface;

at 210 feet, 41°·1; at 480 feet, close to the bottom, 41°·0 Again, on Loch Katrine in 1814, four days earlier than in 1812, he found near the surface, 56°·4; at 180 feet, 41°·9; at the bottom, 41°·3. On Loch Tay, in August 1812, he found at the surface, 57°·2; at 210 feet, 43°·2; at the bottom, 420 feet, 41°·9. These results, if we could only know exactly how they were obtained, are singularly interesting as comparative with mine, got about sixty years afterwards. If they be quite accurate, they indicate a bottom-temperature decidedly below what I have always obtained; and this is quite intelligible under the view I have taken of the probability of annual change, according to the character of the preceding winter; for all the winters preceding the times of Mr Jardine's observations were uncommonly severe. Or, taking a different view of the facts, these comparative observations give no countenance to the fanciful announcement by some late meteorological alarmists, that the climate of Great Britain is undergoing progressive deterioration by descent of the polar ice. Accurate deep-water observations in our deep lakes will in time very easily test this hypothesis; if Jardine's and my own be both correct, they may denote certainly no deterioration, but, if any change, a slight improvement rather. But I have shown how the difference probably arose from a temporary peculiarity of the climate of each year observed. As to Mr Jardine's observations, we cannot now learn exactly how he worked, and we can trust for their correctness only to the character, universally allowed him during his life, of being a singularly acute, exact, conscientious observer of all physical facts and phenomena.